

LEAFLET XLVII.

A STUDY OF A TREE.*

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THE SUGAR MAPLE.

The maple puts her corals on in May,
While loitering frosts about the lowlands cling,
To be in tune with what the robins sing,
Plastering new log-huts 'mid her branches gray;
But when the autumn southward turns away,
Then in her veins burns most the blood of Spring,
And every leaf, intensely blossoming,
Makes the year's sunset pale the set of day.

—LOWELL.



LIKE a friend is a tree, in that it needs to be known season after season and year after year in order to be truly appreciated. A person who has not had an intimate, friendly acquaintance with some special tree has missed something from life. Yet even those of us who love a tree because we find its shade a comfort in summer and its bare branches etched against the sky a delight in winter, may have very little understanding of the wonderful life-processes which have made this tree a thing of beauty. If we would become aware of the life of our tree we must study it carefully. We should best begin by writing in a blank book week after week

what happens to our tree for a year. If we keep such a diary, letting the tree dictate what we write, we shall then know more of the life of our tree.

In selecting a tree for this lesson I have chosen the sugar maple, for several reasons. It is everywhere common; it is beautiful; it is most useful; and it has been unanimously chosen as the repre-

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sentative tree of the Empire State. Let each of us choose some maple tree in our immediate vicinity that shall be the subject



Fig. 284. Sugar maple.

for our lesson now, and again in the winter, and again in the spring. Our first thought in this study is that a tree is a living being, in a



Fig. 285. A sugar maple grown in an open field.

measure like ourselves, and that it has been confronted with many difficult problems which it must have solved successfully, since it is alive. It has found breathing space and food; it has won room for its roots in the earth and for its branches in the light; and it has matured its seeds and planted them for a new generation.

BRIEF PHYSIOLOGY OF THE TREE.

The tree lives by breathing and by getting its daily food. It breathes through the numerous pores in its leaves, and green bark, and roots. The leaves are often

called the lungs of the tree, but the young bark also has many openings into which the air penetrates, and the roots get air that is present in the soil. So the tree really breathes all over its active surface, and by this process takes in oxygen from the air. It gives off carbon dioxid as we do when we breathe.

While the leaves act as partial lungs they have two other most important functions. First, they must manufacture the food for the entire tree. "Starch factories" is the name that Uncle John gives to the leaves when he talks to children, and it is a good name. The leaf is the factory; the green pulp in the leaf cells is part of the machinery; the machinery is set in motion by sunshine power instead of steam or water power; the raw materials



Fig. 286. Silver maple.

are taken from the air and from the sap sent up from the roots; the first product is usually starch. Thus, it is well when we begin the study of our tree to notice that the leaves are so arranged as to gain all sunlight possible, for without sunlight the starch factories would be obliged to "shut down." It has been estimated that on a mature maple of vigorous growth there is exposed to the sun nearly a half acre of leaf surface. Our tree appears to us in an unfamiliar light when we think of it as a starch factory covering half an acre. Plants are the original starch factories. The manufactories that we build appropriate the starch that plants make from the raw materials.

Starch is plant-food in a convenient form for storage ; but as it cannot be assimilated by plants in this form it must be changed to sugar before it can be transported and used in building up plant tissues. Hence the leaves have to perform the office of a stomach in order to digest the food they have made for the use of



Fig. 287. The bole of a sugar maple grown in a wood.

the tree ; they change the starch to sugar, and they take from the sap nitrogen, sulfur, phosphorus, and other substances which the roots have appropriated from the soil, and to these they add portions of the starch, and thus make the proteids which form another part of the diet of the tree. It is interesting to know that while these starch factories can operate only in the sunlight, the leaves can digest the food, transport it, and build up tissues in the dark.

The autumn leaf, which is so beautiful, has completed its work. The

green material which colors the pulp in the leaf cells is withdrawn, leaving there material which is useless, so far as the growing of the tree is concerned, but which glows gold and red, thereby making glad the eye that loves the varying tints in autumn foliage. It is a mistake to believe that the frost makes these brilliant colors : they are caused by the natural old age and death of the leaf, and

where is there to be found old age and death more beautiful? When the leaf turns yellow or red it is making ready to depart from the tree; a thin corky layer is being developed between its petiole and the twig, and when this is finally accomplished the leaf drops from its own weight, from the touch of the lightest breeze, or from a frost on a cold night.

OBSERVATIONS ON THE MAPLES.

We want you to know the maples from actual observation.

Discover the characteristic forms of the tree, the character of bark, fruits, and leaves. Verify the pictures in this lesson.

Though the fruit of the sugar maple matures in midsummer, yet you may perhaps find beneath your tree some of the keys or seeds



Fig. 288. Leaves and fruits of Norway maple.

now partially planted. If the tree stands alone you may perchance see how well she has strewn its seeds, and how many of its progeny have been placed in positions where they can grow successfully.

We have in New York State seven species of maple common in our forests. Two of these are dwarf species rarely attaining thirty-five feet in height, more often found as mere bushes. These two are the mountain maple and the striped maple or moosewood. This latter is sometimes called goose-foot maple, because its leaf is shaped somewhat like the foot of a goose. Of the maples that attain to the dignity of tall trees we have four species: the sugar

maple, the silver or white maple, the red or swamp maple, and the box elder. The leaf of the box elder does not look like the leaf of a maple at all ; it has a compound leaf of three or five leaflets, but the flowers and fruits are those of the maples. There is also a variety of sugar maple that is called black maple. We have planted in our parks the sycamore and Norway maples introduced from Europe, and also ornamental species from Japan. Our native species are easily distinguished from these and from each other ; just a little observation as to the shape of the leaves, the form of the trees, and the character of the bark enables a person to tell all these species at a glance. I hope that you will become familiar with the seven native species. Such knowledge is not only of practical use, but gives real zest and pleasure. When a



Fig. 289. Leaves and fruits of striped maple.

person walks in the morning he should be able to call his tree acquaintances as well as his human acquaintances by name.

QUESTIONS ON THE MAPLES.

1. How many species of maple trees do you know and what are they ?
2. How do you distinguish the red maple and the silver maple from the sugar maple ?
3. What is the shape of the one tree you have chosen to study ?
4. What is there in its shape to tell you of its history, *i. e.*, did it grow in the open or in the forest ? Was it ever shaded on either

side ; if so, what was the effect ? How have the prevailing winds affected its shape ?

5. How old do you think the tree is ?

6. Was the tree injured by storm or insects during the past season ; if so, how ?

7. Study the leaves on this tree and note any differences in shape and color.

8. What is the use of the skeleton of the leaf ?



Fig. 290. Leaves of mountain maple, sugar maple, red maple.

9. Is there always a bud in the axil where the leaf stalk joins the twig ?

10. How are the leaves arranged on the twig ?

11. What is the color of the tree this autumn ?

12. When did the leaves begin to fall ? Place in your note book the date when the tree finally becomes bare.

13. Have you found any seeds from your tree? If so, describe them.
14. How are they dispersed and planted?
15. Are both seeds of the pair filled out?
16. How high is your tree?
17. How large an area of shade does it produce? If it stands alone, measure the ground covered by its shadow from morning until evening.
18. How has its shadow affected the plants beneath it? Are the same plants growing there that grow in the open field?
19. Make a sketch of the tree you are studying, showing its outline.
20. Make a sketch of the leaf of the sugar maple.